

Intermediate Algebra for Calculus Students--Math 98 Support Material

1) Philosophy of this course:

Why was this course created?

With the change in focus of Math 81 and 91 in 2010 from primarily skills-based instruction (factoring, combining rational and radical expressions, , etc) toward ideas more relevant in everyday life, the department was faced with a need for an algebraic skills course for students who were planning to take Pre-Calculus I and II (and eventually Calculus). Since the curriculum in this course was quite different from Math 97, the result was the creation of Math 98—Intermediate Algebra for Calculus Students.

Content Focus of the Course:

The focus of this course is to:

- Prepare students for the types of algebraic manipulations they must be able to do in Precalculus I and II, as well as calculus (see the course adoption form).
- Ensure that students going into Precalculus I and II can use a graphing calculator effectively.
- Give the students a good grounding in the basics of elementary functions and their graphs.
- Encourage the students to improve their communication in mathematics, both in written and verbal form. ,
- Help students become more effective in solving and interpreting results for applied (“word”) problems.

Student Attributes Focus:

In addition to the content focus, we are emphasizing the attitudes and habits identified as key “Student Attributes” in the Washington State Transition Mathematics Project’s *College Readiness Standards*.¹ Note that these attributes are student traits which can and should be fostered throughout the course. The attributes that this course will emphasize are:

- *Students should take responsibility for their own learning* (this should include emphasizing class attendance, getting all work done on time, seeking help when needed, making use of resources available, and setting aside time necessary to succeed).
- *Students should pay attention to detail.* This includes a wide range of activities, such as following all instructions (written and oral) without needing additional reminders, as well as carefully checking written work for accuracy and possible errors.

¹ A complete copy of the attributes and standards – including clarifying examples – can be obtained at <http://www.transitionmathproject.org/standards.asp>.

2) Resource Faculty for Math 98: The faculty who have created this course include:

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Any instructor teaching Math 98 who needs guidance or questions answered relative to any aspect of the course should feel free to contact any of the individuals listed above.

3.) Course Syllabus: Complete information about what to include in your syllabus can be found at <http://flightline.highline.edu/frc/resources/syllabus/index.htm>. A Course Adoption Form (CAF) is included in this packet. It provides a detailed outline of the course material as well as the student learning outcomes. At Highline, the CAF is the official document for the course, and changes to the course require that the CAF be updated and approved by the division chair and vice-president for instruction. Information from the CAF is included in the course catalog and the quarterly course schedules. Your syllabus should include the following information found on the CAF: course description, prerequisite information, calculator requirements, and student learning outcomes. In addition, you should include a statement about students with disabilities and an emergency preparation plan. You can find more information about Access Services at <http://flightline.highline.edu/access/>.

4.) Use of Calculators in Math 98: One of the goals in Math 98 is to ensure the student is well-versed in the basic use of a graphing calculator. The basics that this course should emphasize are found in the attached CAF. The textbook we have adopted strongly supports the graphing calculator and instructors should regularly demonstrate different aspects of calculator use in class. TI-83/84 calculators are recommended for the course.

5.) Course Adoption Form (CAF):

COURSE MASTER INFORMATION

(INFORMATION TO BE PROVIDED BY DEPARTMENT)

Course Abbreviation	Number	Computer Entry Title for Quarterly (24 Spaces Only)
Math	098	Interm Alg for Calculus

Year & Quarter this course was first offered at Highline:	Fall 2010	Next CAF review date:	Winter 2013
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Grading System			
<input checked="" type="checkbox"/> Decimal Grade	<input type="checkbox"/> CR/NC	<input type="checkbox"/> Other: (Specify)	

Capacity & Credits		Continuous Enrollment		Number of Contact Hours					
Class Limit	Credit	Yes	No	Lecture	Lab	Worksite	Clinical	Mixed/Variable	Other
32	5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	55					

Computer Enforced Prerequisite	Math 91 with a minimum grade of 2.0 or COMPASS algebra score of 47
If Permission, List Criteria	
Quarterly Catalog Note	Prereq: Math 091 with a minimum grade of 2.0 or COMPASS algebra score of 47. Graphing calculator required. TI-83/4 recommended
Applicable Fees	

FULL COURSE TITLE: (35 Spaces Only for Title)

Intermediate Algebra for Calculus

CATALOG DESCRIPTION:

This course will expose students to a variety of algebraic techniques and functions that will prepare them for calculus. Focus will be placed on quadratic, rational, and radical functions with emphasis on algebraic techniques used to combine and simplify them. Techniques will include factoring, simplifying (adding/subtracting/multiplying/dividing) polynomials, rational and radical expressions, and relationships between equations and their respective functions and graphs.

Course Abbreviation and Number
Math 098

Who is this course designed to serve?
Designed to Serve: Students who expect to take Math 141, 142 (Precalculus I and II) and Math 148 (Business Calculus)

Course Outline: *(Organization of content)*

The course is organized into five strands:

I. Algebra

- Factor expressions used in Pre-calculus. including quadratics, trinomials, difference of squares, sums and differences of cubes, and polynomials
- Combine and simplify expressions using addition, subtraction, multiplication, and division for
 - Rational expressions including complex fractions
 - Radical expressions with limited variable radicands
 - Expressions with rational exponents
 - Rationalize expressions with monomial/binomial denominators involving only square roots
- Solve various types of equations with an emphasis on
 - Quadratic equations involving completing the square, quadratic formula, factoring, and square root property
 - Rational equations
 - Radical equations involving a maximum of two square roots
- Solve nonlinear inequalities (polynomial and rational) using sign analysis and express solutions using interval notation and understand the relationship between sign charts and graphs of functions
- Combine and simplify complex numbers and convert between radical notation and complex numbers

II. Functions-with an emphasis on quadratics, rational, and radical functions

- For limited types of elementary functions be able to use and interpret functional notation
- Determine the domain and range of a variety of functions algebraically and graphically
- Determine the x and y intercepts and extrema for elementary functions
- Use simple transformations (horizontal, vertical, x-axis rotations) to create graphs of new functions from their basic elementary functions
- Determine intervals where a function is increasing/decreasing
- Algebraically construct new functions using addition, subtraction, multiplication, and division

III. Communication

- Require initial written self-assessment by students, with periodic revision through quarter.
- Summarize and interpret mathematical information from written formats.
- Identify, extract, and organize critical information into mathematical symbols
- Clearly communicate steps using proper terminology, symbolization, and notation.
- Demonstrate attention to detail-students will be able to analyze written material for errors and explain why they are incorrect

IV. Problem solving

- Create realistic mathematical models for applied problems involving polynomials
- Create a suitable quadratic function for modeling a real world situation presented using words, data, or diagram
- Identify and justify whether a result generated from a model has real world significance

V. Technology-emphasis on graphing calculator

- Graph functions choosing the appropriate windows for viewing all details
- Use the calculator to find intercepts, points of intersection, and extrema for functions
- Use the table feature to determine values for functions
- Use a graphing calculator for calculating expression containing multiple operations
- Emphasize quadratic, rational, and radical functions

Student Learning Outcomes of Course Indicate the desirable results that can be expected to occur from this course experience. <i>(These are usually expressed in measurable and observable terms).</i>		Assessment Methods Outcomes measured by the following: <i>(These categories may be changed.)</i>					
		Portfolio	Examination	Written Assignments	Projects	Oral Presentations	Other (Indicate specifics below)
1.	Apply mathematical operations to simplify a variety of mathematical expressions including polynomials, rational, and radical expressions.	X	X	X	X	X	X
2.	Apply mathematical operations to solve a variety of mathematical equations including polynomials, rational, and radical equations.	X	X	X	X	X	X
3.	Successfully construct a sign chart for a variety of functions, specifically polynomial and rational, and discuss their relationship to inequalities and graphs.	X	X	X	X	X	X
4.	Examine key features of important function families-quadratic, rational, and radical functions.	X	X	X	X	X	X
5.	Recognize, describe, and analyze functional relationships presented symbolically, tabular, graphically and verbally.	X	X	X	X	X	X
6.	Effectively use graphing calculators to describe and model functions.	X	X	X	X	X	X
7.	Solve real world problems using techniques discussed in this course.	X	X	X	X	X	X
8.	Model situations and relationships using polynomial functions.	X	X	X	X	X	X
9.	Communicate, summarize, and interpret mathematical ideas in written and verbal form.	X	X	X	X	X	X
Other: Group Work							

6.) Textbook: We adopted a custom version of:

Intermediate Algebra-Graphs & Models, 3rd edition. Bittinger, Ellenbogen, Johnson published by Pearson/Addison Wesley

7.) Assessment: To ensure some degree of uniformity among courses and for assessment purposes, there will be approximately five common questions on the final exam that will address each of the five strands in the course outline. **All instructors** teaching the class in a given quarter will meet during the quarter to compose these questions.

Suggested Assessment Tools

- At minimum 2 Exams
- Comprehensive Final Exam
- Homework that is graded

8.) Homework in Math 98: Instructors teaching Math 98 will have the option of using My Math Lab to facilitate homework (My Math Lab is an on-line homework program that presents and grades homework problems assigned from the textbook or created by the instructor). Students who have taken Math 91 at Highline may already be familiar with My Math Lab. You need to advise the coordinator in advance that you plan to use it. The Math 98 instructor may also choose to assign homework in the traditional mode by having students hand in homework, or a combination of these options can be used.

9.) The College Wide Outcomes:

The College-Wide Student Learning Outcomes are general attributes that all classes at Highline seek to instill in our students. A complete list of the College Wide Student Learning Outcomes can be found at <http://flightline.highline.edu/socc/AssessmentBasics/SLOs/hccslos.htm>. Not all outcomes are measurable in every course. The degree to which each outcome is addressed in Math 98 (on a scale of 0-4) is indicated below

College Wide Outcomes (Math 98):	Score (degree outcome is addressed, on scale of 0- 4)
1. Think critically	4
2. Reason quantitatively	4
3. Communicate effectively	3
4. Civic responsibility in diverse and multifaceted environments	1
5. Information/visual literacy	2

10.) Required Sections to Cover and Suggested Quarterly Schedules/ Pacing for Math 98:

(Note: this is only a suggested schedule to use as a guide. Individual instructional styles vary and days required for a given section may vary). The sections below are required material with the exception of 5.8

Section	Days	Comments	Section	Days	Comments
2.1	2		7.1	2	
5.1	1		7.2	2	
5.2	1		7.3	1	
5.3	2		7.4	1	
5.4	1		7.5	1	
5.5	2		7.6	1	
5.6	1		7.8	2	
5.7	1				
5.8	2-optional		8.1	2	
			8.2	1	
6.1	2		8.4	1	
6.2	2		8.6	2	
6.3	1		8.7	1	
6.4	1		8.9	2	

Total instruction days: 38

Review and Testing days: 8

Additional Days available: 3-4

Sample Schedule for a 5-day week class with 3 exams and Final

Week	M	T	W	T	F
1	2.1	2.1	5.1	5.1, 5.2	5.2
2	5.3	5.3	5.4	5.4	5.5
3	5.5	5.6	5.6	5.7	
4	Exam 1	6.1	6.1	6.1, 6.2	6.2
5	6.2	6.3	6.3	6.4	6.4
6	7.1	7.1	7.1, 7.2	7.2	7.3
7	Exam 2	7.3	7.4	7.4	7.5
8	7.5, 7.6	7.6	7.8	8.1	8.1
9	8.2	8.4	Exam 3	8.6	8.6
10	8.6, 8.7	8.7	8.7	8.9	8.9
11	Finals Week				

Sample Schedule for a 2-day week class with 3 (1 hour) exams and Final

Week	M	T	W	T	F
1		2.1		5.1, 5.2	
2		5.3, 5.4		5.4, 5.5	
3		5.5, 5.6		5.7, 6.1	
4		Exam 1 6.1		6.2, 6.3	
5		6.3, 6.4		7.1	
6		7.2, 7.3		Exam 2 7.3	
7		7.4, 7.5		7.5, 7.6	
8		7.8, 8.1		8.1, 8.2	
9		Exam 3 8.2		8.4, 8.6	
10		8.6, 8.7		8.9	
11	Finals Week				

11.) Activities that help foster the Student Attributes:

Below is a model of what an instructor used to help students prepare for an exam.

Preparing for an Exam Assignment

Due Date: ****

Worth: 10 points

All homework requirements must be followed to receive any credit.

- 1) Write an **outline** that lists the concepts (topics) that will be covered on the exam. You might want to include sub-categories for some topics. For example, functions could include finding domain and range, function notation, etc. The goal here to make sure that you list all topics so that you remember to study everything. You should include a topic for application problems also because they will be on the exam. Note – do not list section or chapter numbers where the topics are located. The idea here is to generalize what you know about the concepts and not focus on the section or chapter numbers.
- 2) Write down any **definitions, formulas**, or ideas for these concepts that you think you should know for the exam. Example: a horizontal line has a zero slope and can be written in the form

$$y = \text{constant}$$

Note-these definitions could also be written on note cards for quick studying.

- 3) Select three **problems** for each concept that you think would be good test questions:
 - These problems can be from homework, lecture, examples in the book, chapter review problems, problems from other textbooks (MRC is a great resource for these), etc...
 - Try to select a problem that you think is relatively easy, one that is difficult that you think you would struggle with, and one that is not too easy but you are confident that you could correctly.
 - Write any directions that are needed for the problem.
 - If you have the solution to these problems, write them down to the right of the problem.
 - Do not show any work for these problems.
 - Do not indicate which section or chapter the problem came from because you want to focus on concepts, not section numbers (you will be tested on concepts, not section numbers)
- 4) On a separate sheet of paper, select one problem from each concept and write them down with the directions. This is a **prep exam** that you can take later for practice.
 - Select an easy problem for one concept, a difficult one for a different concept, etc.
 - Mix the problems up on the sheet so that they are not in the order of the textbook.
 - You may also choose to put some true/false or “fill in the blank” problems related to definitions also.

Below is an activity that an instructor used to help students learn how to calculate their grade for the course.

Math 98

Name_____

Score_____/10

This assignment will be checked at each exam and graded at the end of the quarter for accuracy and completeness. Record your scores for each assignment, quiz, and exam below:

Hw#1: ____/10

If there are any other assignments, please list them here and indicate how many points the assignment is worth:

Hw#2:____/10

Hw#3:____/10

pop quiz 1____/

Hw#4:____/10

Hw#5:____/10

Hw#6:____/10

Hw#7:____/10

Hw#8:____/10

Hw#9:____/10

Exam#1:____/100

Exam#2:____/100

Exam#3:____/100

Before each exam, calculate your current grade percentage (at the time of the exam) below. Show your calculations in how you determined this. Then, reflect on your performance up to that exam. Discuss how you prepared for the exam and study for the class on a regular basis. Are you happy with your current grade? If not, suggest some ways to improve. If extra space is needed, please attach additional sheets.

Grade before exam#1:

Grade before Exam#2:

Grade before Exam#3:

Grade before the Final Exam:

Hand this sheet in the day of each exam and at the final. You will receive 10 points on this assignment at the end of the quarter if all scores are recorded accurately, grade percentages are calculated correctly, reflections at each exam/quest are provided, and this sheet was checked at each exam. Points will be deducted for incomplete or inaccurate scores and/or calculations as well if it was not checked at each exam.

Below are some activities that instructors have used to reinforce attention to detail over various algebraic procedures. You are encouraged to create others for the remainder of the course material

Can you find all the errors?

Name _____

Each problem contains an error. Circle each error and clearly explain what the error is.

$$\frac{4}{x+2} - \frac{7}{x-3}$$

$$= (x+2)(x-3) \left(\frac{4}{x+2} - \frac{7}{x-3} \right)$$

$$= 4(x-3) - 7(x+2)$$

$$= 4x - 12 - 7x - 14$$

$$= -3x + 2$$

$$\frac{4x}{3} + 1 = \frac{7x}{6}$$

$$3 \left(\frac{4x}{3} + 1 \right) = \left(\frac{7x}{6} \right) 6$$

$$4x + 3 = 7x$$

$$1 = 3x$$

$$\frac{1}{3} = x$$

$$\frac{3}{y+2} + \frac{5}{y}$$

$$= \frac{3}{y+2} + \frac{10}{y+2}$$

$$= \frac{13}{y+2}$$

$$\frac{4-p^2}{3p^2-5p-2}$$

$$= \frac{(2+p)(2-p)}{(3p+1)(p-2)}$$

$$= \frac{-1(2+p)(p-2)}{(3p+1)(p-2)}$$

$$= \frac{-2+p}{3p+1}$$

$$\frac{m^2-n^2}{m-n} \div \frac{m}{m^2+nm}$$

$$= \frac{\cancel{m}^2 - \cancel{n}^2}{\cancel{m} - \cancel{n}} \cdot \frac{\cancel{m}^2 + nm}{\cancel{m}}$$

$$= \frac{m-n}{1} \cdot \frac{m+nm}{1}$$

$$= (m-n)(m+nm)$$

$$= m^2 + m^2n - mn - mn^2$$

$$\frac{\frac{3}{g}+5}{5-\frac{3}{g^2}}$$

$$= \frac{\frac{3}{g}+5}{g^2} \cdot \frac{g}{5-\frac{3}{g^2}}$$

$$= \frac{3+5g}{5g^2-3}$$

$$\begin{aligned}
& \frac{2h+1}{5} - \frac{3h-1}{h+3} \\
&= \frac{h+3}{h+3} \cdot \frac{2h+1}{5} - \frac{5}{5} \cdot \frac{3h-1}{h+3} \\
&= \frac{(h+3)(2h+1)}{5(h+3)} - \frac{5(3h-1)}{5(h+3)} \\
&= \frac{2h^2 + 7h + 3 - 15h - 5}{5(h+3)} \\
&= \frac{2h^2 - 8h - 2}{5(h+3)} \\
&= \frac{2(h^2 - 4h - 1)}{5(h+3)}
\end{aligned}$$

$$\frac{q}{q+4} + \frac{4}{q+4} = 3q$$

$$= \frac{q+4}{q+4}$$

$$= 1$$

$$\frac{2y}{y-3} + \frac{4}{y+3} = \frac{8y}{y^2-9}$$

$$\frac{2y}{y-3} + \frac{4}{y+3} = \frac{8y}{(y+3)(y-3)}$$

$$(y-3)(y+3) \left(\frac{2y}{y-3} + \frac{4}{y+3} = \frac{8y}{(y-3)(y+3)} \right)$$

$$2y + 4 = 8y$$

$$4 = 6y$$

$$\frac{2}{3} = y$$

$$1 + \frac{3}{x+1} = \frac{x}{x-1}$$

$$(x+1)(x-1)\left(1 + \frac{3}{x+1} = \frac{x}{x-1}\right)$$

$$(x+1)(x-1) + 3(x-1) = x(x+1)$$

$$x^2 - 1 + 3x - 1 = x^2 + x$$

$$3x - 2 = x$$

$$-2 = -2x$$

$$1 = x$$

Below are some Time Management Templates:

Homework/Assignment Sheet

Name:		Week Beginning:	
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Due Dates	Monday	Tuesday	Wednesday	Thursday	Friday
Math 98					
Course 2					
Course 3					
Course 4					

Upcoming Exams, Quizzes, or Writing Assignments		
Course Name:	Date:	What do I need to Bring?

Quarter: [Fall, Winter, Spring, Summer]

[illegible]

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
AM							
6:00 -7:00							
7:00-8:00							
8:00-9:00							
9:00-10:00							
10:00 -11:00							
11:00-12:00							
PM							
12:00-1:00							
1:00-2:00							
2:00-3:00							
3:00-4:00							
4:00-5:00							
5:00-6:00							
6:00-7:00							
7:00-8:00							
8:00-9:00							
9:00-10:00							
10:00-11:00							
11:00-12:00							